ILRS Station Change Tracking

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Introduction

- It is crucial for stations to report changes to their equipment, software, and procedures

- Failure to do so can have ramifications for analysis of the global SLR data and cast doubts on a station's data quality and stability

- To avoid such consequences, the ILRS has methods for stations to use for recording stations changes so that they are available to the analysts

Methods of Reporting Station Changes

- CRD configuration records
- Station change history logs
- Station site logs

- *Each method fulfills a separate function*

Method 1: CRD Configuration Records

- Found in CRD format document

http://ilrs.gsfc.nasa.gov/docs/2009/crd_v1.01.pdf

- Should be present for each pass in the normal point and full rate data files (some stations need to add these)

- Captures pass-by-pass changes to configuration; always stays with the data!

- Contains records for laser, detector, timing, and transponder setup

- Must change when there is a related change to the station!

CRD Configuration Record Example

MLRS (McDonald):
c0 0 532.000 std ml1 mcp mt1
c1 0 ml1 Nd-Yag 1064.00 10.00 -1.00 200.0 -1.00 1
c2 0 mcp mcp 532.000 -1.00 3800.0 0.0 unknown -1.0 0.00 -1.0 0.0 none
c3 0 mt1 Symmetricom_Cs_4310 Symmetricom_Cs_4310 MLRS_CMOS_TMRB_TD811 na -2.3

GLSL (Golosiiv):
C0 0   532.000 sys1 las1 det1 tim1 none
C1 0 las1   Nd-Yag   1064.00   10.00   2.00   52.9 15.00   1
C2 0 det1 PMT 532.000 8.00 -2500.0 0.3 photon-dep 15000.0 532.00 70.0 60.0 CFD
C3 0 tim1 MAO_Time_Servise Rubidium_C1-50 SR620 2944 1.5

STL3 (Mt. Stromlo):
C0 0 532.10 IDAA IDAB IDAJ IDAV
C1 0 IDAB Nd-YAG 532.10 60.00 21.00 12.0 0.00 1
C2 0 IDAJ CSPAD 532.00 20.00 11.0 100.0 ECL 12.0 2.00 90.0 12.0 Manual
C3 0 IDAV TrueTime_XLi TrueTime_OCXO MRCS NA 0.2322

Method 2: Station Change History Log

- File available on the ILRS website at
  ftp://cddis.gsfc.nasa.gov/slr/slrlog/slrhst/

- Similar in format to the old SCH files, but with additional information on sub-system, level of impact

- One line per change, enough for the station to find more detailed records if questions arise

- Entries are cumulative

- Can include info on hardware, software, construction, earthquakes, etc.

Change History Log Example

% PPPPSSMM - Site Occupation Designator (SOD)
% YYYY - Year
% DDD - Day of Year
% HH:MM - Time of Day (UTC) when change becomes active % F - Estimated Chance of Data impact Flag:
    0=none; 1=maybe, but negligible;
%   2=slight influence possible; 3=YES, needs quarantine and verification by the ILRS.
% xx[.xx[.xx]] - Subsystem: enter the subsystem number from the site log,
%   e.g. "12.01" for pressure sensor.
%   Use 99 for those subsystems not mentioned in the site log, e.g. computers,
%   software, multiple sub-systems.
% Text - Description of the change. This must be meaningful to the station personnel,
%   so that more information can be made available to analysts if needed
%
% Remember to send this file to ILRS (edc@dgfi.badw.de) after each update
…
71100412 2013 194 00:30 1 9 Installed TCG G77086 (removed G78519); new STA-RB = 4.046 microsecs;
    incremented processor & controller config flags 3 to 4.
71100412 2013 273 23:52 0 9 Installed M04198; incremented config flags from4 to 5. 5370B Counter
71100412 2013 276 21:00 1 9 Removed M04198. 5370B Counter
71100412 2013 276 23:52 1 9 Installed G78762. 5370B Counter
71100412 2013 280 21:20 1 9 Removed G77401 - having fluctuations) XL-DC GPS
71100412 2013 280 21:58 0 9.02.01 Installed spare XL-DC SCNS0150; Incremented config flags to a 6.
71100412 2014 024 21:20 0 9.02.01 Removed XL-DC (SCNS 0150) with SCNS00271
71100412 2014 024 23:52 0 9.02.01 Installed SCNS000271, incremented flags on 1/31/14. XL-DC GPS
71100412 2014 098 00:00 1 6 Changed receive cable.

Method 3: Site Log

- Kept on ILRS web site at ftp://cddis.gsfc.nasa.gov/reports/slrlog/

- Consists of contact information, survey information, and a history of station configuration changes by sub-system

- Meant to be thorough, detailed, and cumulative

Site Log Contents

ILRS Site and System Information Form

International Laser Ranging Service

0. Form

1. Identification of the Ranging System Reference Point (SRP)

2. Site Location Information

3. General System Information

4. Telescope Information

5. Laser System Information

6. Receiver System

7. Tracking Capabilities

8. Calibration

9. Time and Frequency Standards

10. Preprocessing Information

11. Aircraft Detection

12. Meteorological Instrumentation

13. Local Ties, Eccentricities, and Collocation Information

14. Local Events Possibly Affecting Computed Position

15. On-Site, Point of Contact Agency Information

16. Responsible Agency (if different from 15.)

17. More Information

Let's tie this all together
with an example -
Herstmonceaux 10Hz and Khz lasers...

From the Herstmonceaux Site Log

5.   Laser System Information

5.01 Laser Type   : ND:YAG
       Number of Amplifiers   : 2
       Primary Wavelength   [nm]: 1064
       Primary Maximum Energy [mJ]: IR not used for ranging
       Secondary Wavelength   [nm]: 532
       Secondary Max. Energy [mJ]: ~20
       Xmit Energy Adjustable   : NO
       Pulse Width (FWHM)   [ps]: ~100
       Max. Repetition Rate   [Hz]: 14
                       ...
5.02 Laser Type   : Nd:Van
       Number of Amplifiers   : 2
       Primary Wavelength   [nm]: 1064
       Primary Maximum Energy [mJ]: IR not used for ranging
       Secondary Wavelength   [nm]: 532
       Secondary Max. Energy [mJ]: 0.5
       Xmit Energy Adjustable   : NO
       Pulse Width (FWHM)   [ps]: 10ps
       Max. Repetition Rate   [Hz]: 2000
        ...

From the Herstmonceaux Change History Log

78403501 2013 008 08:30 2 08.01   New power supply fitted to Lecroy discriminators to eliminate cause of calibration jumps

78403501 2013 128 08:30 1 05.02   2kHz Nd:VAN laser back in operation

78403501 2013 130 08:30 1 06.01.07 Gate cable to SPAD changed

78403501 2013 137 08:30 1 05.02   2kHz laser start diode adjustment

78403501 2013 207 08:30 1 08.01   TR reduction software adjusted for better performance with kHz signal to noise

78403501 2013 211 08:30 0 05   Coude mirrors M2, M3 and M4 replaced

78403501 2013 221 08:30 1 05   Emitter end optic cleaned

78403501 2014 027 08:30 1 05.01   Nd:YAG laser service and pulse selector trial. Completed 3/2/14 and selector removed.

78403501 2014 035 08:30 2 05.01   Nd:YAG start diode and discriminator adjusted to improve calibration leading edge.

78403501 2014 056 08:30 1 99   Electrical rewiring in control room, offices and in telescope dome.

Herstmonceaux CRD Configuration Records

10 Hz laser:

C0 0   532.080   ES 10hz SPD5 HMas T2L2

C1 0 10hz   Nd-Yag   1064.16   10.00   20.00 100.0 20.00   4

C2 0 SPD5 SPAD5   532.000 20.00 0.0   0.0   +0.7v 0.0 0.15 20.0   0.0 Single_fot

C3 0 HMas iMaser_3000 iMaser_3000 HxET_=_3x_dassault   55   0.148

Khz laser:

C0 0   532.080   KS khz SPD5 HMas T2L2

C1 0 khz   Nd-Yag   1064.16   1000.00   1.10 10.0 20.00   1

C2 0 SPD5 SPAD5   532.000 20.00 0.0   0.0   +0.7v 0.0 0.15 20.0   0.0 Single_fot

C3 0 HMas iMaser_3000 iMaser_3000 HxET_=_3x_dassault   55   0.188

Conclusion

- Recording and reporting station changes is required to guarantee a station's data set remains useful

- The procedure is not onerous, but does require diligence. When a change occurs, it must appear in the data, the change history log, and site log

- Each of the 3 methods provides different information for different purposes